ENGINEERING • TECHNOLOGY • INFORMATION

February 15, 2019

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington DC 20554

**Re: Federal Communications Commission**
**Proposed Rules - Unlicensed Use of the 6 GHz Band**
**ET Docket No. 18-295, GN Docket No. 17-183; FCC 18-147**

Ms. Dortch:

Electro Systems Engineers, Inc. (d.b.a. ESEI) is engaged in the engineering, integration, and management of communications and information technology networks and systems including wireless infrastructure. Since 1994 we have supported Public Safety Organizations, Critical Infrastructure Companies, and Wireless Carriers implement, optimize, and maintain wireless networks including microwave radio systems operating in the 5.925 to 7.125 GHz frequency band which the Federal Communications Commission (Commission) now proposes to share with unlicensed users.

This letter expresses our opposition and concern with the Commission's proposal because of the potential negative impact it can have on the reliable operation of critical communications networks. The point-to-point microwave radio systems licensed in the mentioned band are used as backbone systems for Police and Fire; Electrical and Water Utilities; Oil and Gas; and Wireless communications services. In all cases, the 6 GHz radio systems play an integral role in protecting the lives and safety of employees, contractors, and the public in general.

In the late 1990's and early 2000's private Fixed Microwave Service (FS) were relocated from the 1.9 GHz and 2.1 GHz bands to the 6 GHz band and in particular the U-NII-5 and U-NII-7 sub-bands. Since then, FS systems have operated following the Commission's Rules and Regulations which outline specific frequency coordination and licensing procedures based on sound and proven engineering standards and industry best practices. In addition, the Commission's Rules and Regulations outline technical parameters for radio equipment and antenna systems to ensure uniformity in the design and operation of such systems.

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Coordination of the microwave radio systems operating in the 6 GHz band includes impact of Co-Channel, Adjacent Channel and second Adjacent Channel to receivers in a specific radius and considers radio parameters to determine if there is potential interference into an incumbent system. In addition, incumbents of proposed radio systems being coordinated are notified, via "prior coordination notices", to allow them time to comment in case there are questions regarding the proposed system.

The specificity of the current Rules and Regulations also permits the resolution of interference issues between individual parties without the need for intervention from the Commission or any other regulatory body.

The current coordination and licensing process should not be trivialized by those seeking to superimpose unlicensed systems in the same spectrum. The Commission is practically brushing aside good and well proven engineering practices by allowing users to operate in the same space but with different rules. This is impractical and unfair at best and it will create ambiguity and uncertainty.

It appears that the Commission is basing this last proposed rules on the report performed by RFK Engineering Services and provided by Harris, Wiltshire and & Grannis LLP (https://ecfsapi.fccfcc.gov/file/101261169015803/6%20GHz%20Ex%20Parte%20(Bureaus).pdf). The recommendations outlined in this report are troubling because of the assumptions and the "averaging" approach to the issue of interference.

The coordination and licensing of the U-NII-5 and U-NII-7 Bands, under the Commission's Rules and Regulations, was intended to protect the licensee from interference and insure standards were met. What recourse will the Commission expect once interference begins to occur in the U- NII-5 and U-NII-7 bands in the mix of licensed and unlicensed spectrum? Will private FS users need to take unlicensed system owners and manufactures to court to litigate their responsibility and accountability for real damages and loss of business as the result of system interference?

We are especially troubled by the proposal to have an automated frequency control (AFC) system and database to coordinate unlicensed users on an ad-hoc basis. The idea that these AFC systems will identify potential interference automatically when it takes several weeks to properly coordinate a system under today's frame work is far from realistic. The most important question is: who is going to ensure that the AFC system yields the necessary results to avoid interference into incumbent FS radio users?

Furthermore, what will happen when a new FS systems is coordinated? How will coordinators know that an unlicensed system is operating in the coordination radius and what information will be available to assess the impact? If the coordination of a new system determines potential for interference, will the unlicensed system be relocated?

Any AFC system would have to include both co-channel and adjacent channels when determining permissible frequencies for unlicensed systems as both contribute levels of interference into victim receivers. In addition, AFC systems and database would have to be updated on an ongoing basis to make sure all unlicensed users are accounted for. This could turn into a titanic and costly effort. Who would be responsible for the financial cost?

What about the vulnerabilities of an AFC system and database to cyber-attack? If not done right, the Commission's new rules may be opening critical communications systems cyber-attacks that could affect specific or wide spread communication links. This, even when most (if not all) of the users of FS systems are asked to implement cyber security mechanisms to protect against attacks. Companies which comprise the Nation's Critical Infrastructure will have a new cyber attack vector, with no control or mitigation capabilities. The AFC system could allow unlicensed systems to operate on specific licensed frequencies for each region, causing Critical Control links to no longer function.

We are aware of several examples where well designed point to point unlicensed spread spectrum links were taken down by other unlicensed systems. We can cite the time when a client's point-to-point unlicensed link would stop working for minutes several times during the day. With a spectrum analyzer in place, we discovered that passing trains, which use the same unlicensed frequencies to communicate between engines, would generate severe interference into our client's system making it useless. The only solution left for our client was to design and install a licensed radio link.

Any interference protection criteria used by the AFC system to determine whether a standard-power access point would cause harmful interference to a fixed link receiver would have to include the effects of all interfering sources in aggregate. This is highly important since interference can be the result of the cumulative effect of multiple interfering sources in detriment of the victim receiver.

Most FS radio systems are designed to operate at 99.999% or 99.999% propagation reliability; in addition mechanisms such as Space Diversity, Automatic Power Control, and Adoptive Code Modulation are used to counter the effects of fading and to create highly reliable digital communications links. When fading occurs, receivers are particularly prone to the effects of interference. Relaxing interference criteria to allow other users to share the band will not be a sound decision because the effects will be mostly sensed by the incumbent radio systems.

The Commission indicates that, under the new rules, every standard-power access point would have to be professionally installed. The problem with this is that there is not a single technical certification to assess the capabilities of the installers. Every company can certify the use of qualified personnel to install, operate and maintain their systems. But many of the companies which will purchase these unlicensed systems may not have the expertise to evaluate the professionalism of installers. In our opinion, it would have to fall to the manufactures to install, maintain and certify these unlicensed systems. For this reason, liability resulting from interference problems must be shared between the Manufacture, Distributers and owners of all unlicensed systems; just like liability currently falls on the owners and operators of the installed licensed radio base.

Sharing of the band cannot be expected to work without a clear and enforceable interference protection and resolution process to resolve operational interference issues. Whatever organization is selected to provide AFC services would have to be an integral part of this process.

**Summary**

ESEI strongly opposes the implementation of unlicensed operations in the 6 GHz band, as it poses a significant risk to companies which provide critical services to the Nation. These include Public Safety, Electric Power, Natural Gas, Water, Public Safety and Communications. The potential of interference into their licensed systems cannot be minimized or trivialized by those seeking unlicensed system operations. We understand the need for additional bandwidth to support new technologies, but not at the high cost of risking our Nation's Critical Infrastructure.

If the Commission proceeds to open the 6 GHz band to unlicensed operations, despite years of documented microwave radio experience, it must take strong steps to prevent, long term, interference to critical communications microwave radio systems. This cannot be trivialized nor implemented with idea that steps to curtail interference will be figured it out later.

Respectfully,

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